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THE ECOSYSTEM APPROACH TO ECOLOGICAL RESTORATION MANAGEMENT CASE STUDY - TROTUS HYDROGRAPHIC BASIN

Maricica STOICA
Academy of Economic Studies, Bucharest, Pita Romana, 6, Bucharest, Romania
hagimamioara@yahoo.com

Abstract
Ecosystem approach proved to be the most efficient strategy for integrated management of soil, water and life which promotes conservation and sustainable use in an equitable application of the ecosystem approach helps to achieve a balance of natural components, socio-economic and weather and climate phenomena with adequate scientific methodologies multidisciplinary and transdisciplinary.Such an approach is now imposed on the European level in flood risk management, to make a river basin as the effects of climate change on natural and human systems beyond administrative boundaries, therefore, the correct approach is the basin that provides first reconstruction of ecosystems in the pelvis, so as to reduce the risk of flooding, and on the other hand, socio-economic sustainable development in harmony with the pool. In this paper the author presents ecological, economic and social situation of the basin Trotus, causes that lead to ecological disaster, propose the ecological reconstruction of the basin management under the European Community regulations and planning intervention using the ecosystem approach to basin-analysis using the Logical Framework.
Keywords: floods, landslides, hydrographic basin, ecosystem approach, ecological restoration, management.

1. INTRODUCTION

Starting 1990 in Basin Trotus held important social and economic changes impact on the environment and climate change locale. The restructuring of local industri: the exploitation and processing of oil, coal, salt, wood, unemployment and early retirement and return of forests was accompanied by massive deforestation of forests that have changed the structured geomorphological bazinului M. Stoica et al. (2004). Floods who followed in the years 2005, 2008 and 2010, have generated significant property damage, human and environment due to the fact that post disaster interventions were not based on an ecosystem approach to basin but it occurred locally, and preferentially works erroneously, especially before the elections.

2. LITERATURE AND SPECIFIC LEGISLATION

Ecosystem approach, gaining increasingly more land in conservation and restoration projects, most often involving stakeholders Armsworth et al. (2007). Framework metotologic science on ecosystem approach is governed by the twelve principles set the Convention on Biological by Diversity CBD and Guide to use the Ecosystem Approach.

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Ecosystem approach advantages are:

- priority attention is given to relations between different elements of an ecosystem which encourages integrated management there of Wrona F. (1994)
- focus on long-term problems or large-scale adoption of a strategy allowing anticipation and prevention-oriented "rather than the method currently used, reaction and correction".

Regulations on land rivers in Europe: Water/2000 Framework Directive and Directive on Assessment and Risk Management Flood/2007 promote a new concept with the main objectives of reducing flood risk and conservation of aquatic biodiversity. The new strategy of development of rivers, streams and ponds are considered to form their complex ecosystems that include adjacent land, flora and fauna and water courses.

Balanced ecosystems depend on the regime of water courses that flow, sediment, water temperature and other variables have a clear role. In the event of changes in these variables relative to the naturally existing balance is disturbed. The reason for arranging river by engineering works should aim at maintaining the time and space of the global dynamic equilibrium water courses. Under these regulations, to plan reconstruction Trotus Basin is required to use the "Logical Framework Approach" (LFA).

3. DATA SOURCES FOR APPLICATION

Trotus basin ecosystem status was evaluated in Project 1136/2004-2006 CNCSIS ,,Research on the ecosystem approach to sustainable development at administrative level-territorial'' manager project Maricica Stoica. Evolution last period was based on data obtained from the Romanian Waters National Agency Siret-Bacau, Bacau Forestry Directorate, Department of Agriculture and Rural Development, Bacau, Summary 2005, 2008.2010, County Committee for Emergency Situations, Bacau.

4. METHODS

4.1. Presentation geographical, administrative and hydrological basin

Trotus River occupies a length of only 162 km, or about 1.1% of the entire length of the hydrographic network in Romania. However, Trotus basin area, ie the meadow and stream flow with its tributaries totaling 4456 km^2, ie 445 600 ha over the three counties that crosses from its source of the county and to the mouth near the village rust in Vrancea County. The exclusive territory of Bacau County Trotus basin occupies about 2948 km^2 (about 300,000 ha), ie about 90% of the agricultural area of the county and about 44% of its total area.

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The basin is located Trotus 2 cities, 4 towns and 27 communes that are about 300,000, or 45% of the county population. Compared to other rivers in Bacau, Trotus basin consists of a river system, highly vascularized (Figure 1) consisting of 176 rivers and streams, river tributaries Trotus benefit of 20 active (always bring water) of the twelve on the right and eight on the left side of their Agas, Tazlău and Bistrita is particularly susceptible to water accumulation. Need subiliniat and bumps for tributaries that starts from "0" m (800-1000 m above level Trotus on both sides, especially in the high-delimited Comanesti and Faget).

FIGURE 1 - TROTUS HYDROGRAPHIC BASIN

In addition, there are a number of other 15 tributaries that are activated only during major rain and become, because of slopes and massive deforestation, water overflows true. The landscape in which the Basin of Trotus is flanked by high mountains north of Ciuc and Tazlăului that the county will reach heights of over 1500 m with a time out area to the south Dărmăneşti and honest hills dominate up to 800 m that are settled in the plain which stretches to the mouth of the Siret river in north county Adjud, coming in to town Slobozia-Urechesti.

4.2. Causes which led to the flooding

Following the research done, have been identified causes that led to the flooding Stoica and Berca (2006):

a) Increase over 10 times the content of greenhouse gases in the stratosphere over the territory including significant emissions generated from the study because years ago the chemical combined in the area led to the acceleration of regional inversion temperature, the extreme climate changes together (from 2003) of numerous storms and even tornadoes.

b) The general trend of aridity of the climate at globals in the central-eastern Europe has contributed to increased torrential rainfall and water flow.

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c) Reduction of soil capacity to retain water. The phenomenon itself refers to soil compaction and consequently, damage the soil structure, water to air ratio alteration by loss of large pores that allow water to penetrate deeply and retain it to the structural aggregates.

d) The lack of corrected work torrents and soil erosion.

e) Afforestation drastic reduction of the basin by 20-30% due to following reasons:

- breaking up into small forest properties under 1-2 ha, following the creation of property rights;
- poverty caused the massive availability of personnel in the area (mining and processing oil, salt, wood and construction materials);
- clearing the forest belts landowners;
- not involving local authorities and state institutions to stop deforestation by forest owners, most times, they proved to be a party to plunder forests and timber exports;
- historical causes: massive deforestation to increase farmland in the county before 1989.

f) Localities the river's tributaries râurilui Trotus and developed in a chaotic space, the total or partial replacement of components and semi-natural conditions, hydrographic network and simplify the transformation, fragmentation and connectivity restriction. Expansion of villages was done by deforestation in river basins or river bed reaching where, in some areas, the coefficient of urbanization of the basin is greater than the coefficient of afforestation, which stimulated production imbalance floods and landslides.

g) Sawdust huge quantities, along with other organic and inorganic materials have contributed to the induction of the streams and river blockages and even change the geological and geographical configuration of the basin.

Deforestation of forest behind the house (Figure 2) and deposits of sawdust in the river bed (Figure 3) are present throughout Trotus Valley and its tributaries.

FIGURE 2 - DEFORESTATION OF FOREST BEHIND THE HOUSE

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FIGURE 3 - SAWDUST BANKS OF THE RIVER TROTUS

h) Reducing transport capacity by clogging riverbeds due to massive transport of sediments on the slopes in torrential rain.Huge amounts of rock and sediment are estimated only for 2005 to over 150 million tons. They blocked the river bed river changed course and poured across localities. Tens of thousands of tons, sometimes hundreds of thousands of tons of material dislodged from the mountains of the streams were hauled by river Trotus bed.

i) Lack of flood risk maps.

We can say that the years 2005, 2008, 2010 catastrophic floods were the result of a synergism between termoclimatice disorders caused by toxic gases and pollution of the stratosphere with massive human degradation manifested in particular by deforestation in the basin Trotus.

j) Soil and geological condition can be characterized as follows:

- Alluvial soils under the mountain, hill, plain, made of fine and very fine components, and skeletal silt depending on the nature and frequency of large floods. Except compress the surface area, these soils are soft regardless of their taxonomic classification.
- Soils gray high hills, and the subpădure, and brown clay-iluviale podzolizate are partially sunk and sunk. In addition, skeletal soils and rocks are placed mostly in the high. Both the soils of the plains and the hills and mountain areas of exposed soils in 2005 were in an advanced stage of compaction, in other words, penetration coefficient and the accumulation of water in soil are very small.

  Such soils greatly reduce the amount of filtered water and the permeating, contributing decisively to the surface leakage. In Figure 4 flow is restored events leading to the risk.

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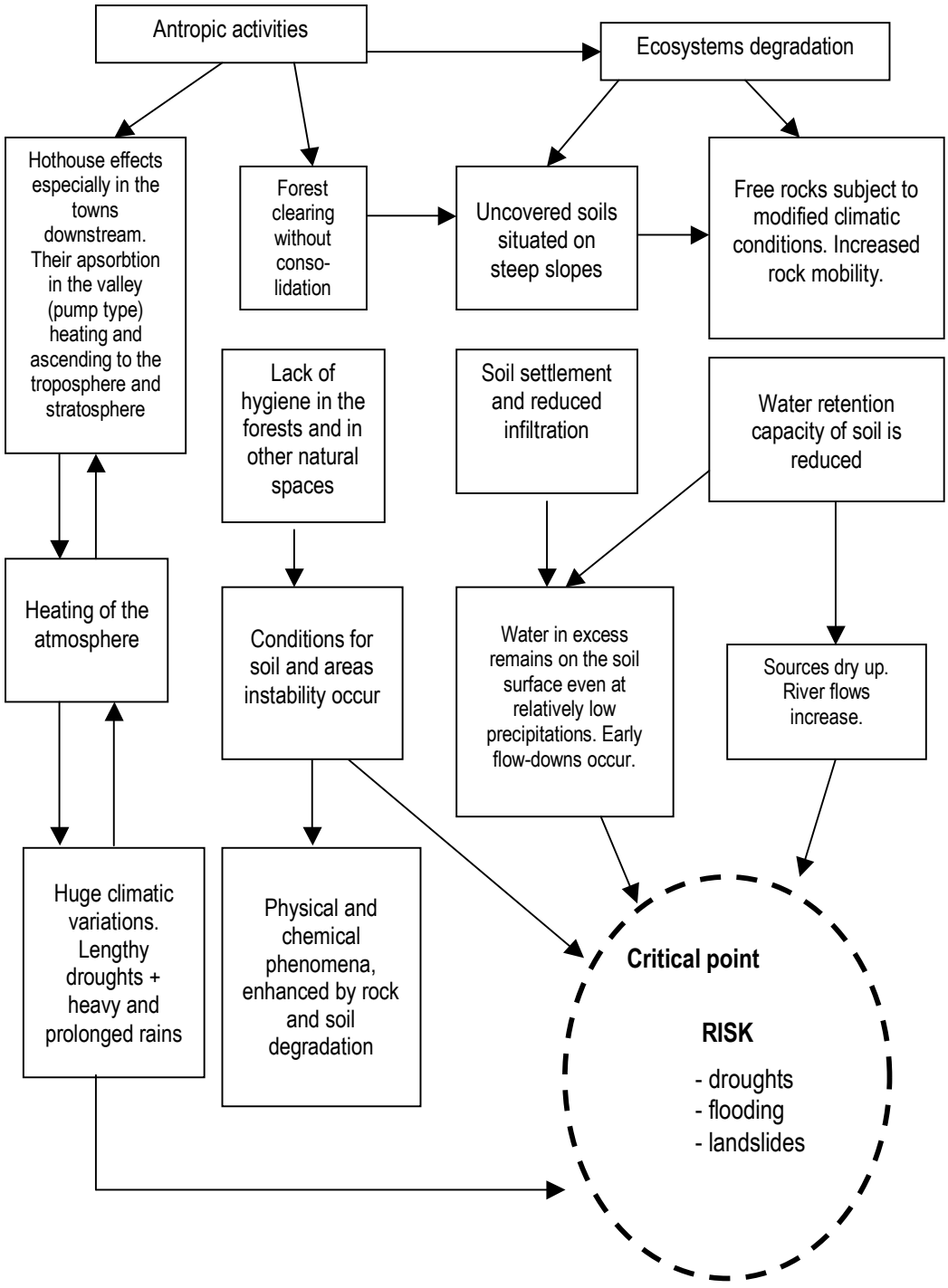

FIGURE 4 - RISK INDUCING EVENTS IN THE TROTUS BASIN

4.3. Losses

Material losses were very high, all localities were affected basin, various material damage was recorded (houses destroyed, damaged houses and annexes, road transport infrastructure, roads, streets, bridges, culverts, utility infrastructure, arable land), their value being estimated at 165 000 Euro for 2005.

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122 thousand euros for the year 2008 and 420 000 Euro for 2010 (Synthesis Report 2005, 2008, 2010). What was not able to assess the losses of ecological values which far exceed the material and ecological restoration of the basin is lengthy and extremely costly. These losses are reflected in the following forms:

a) Over the meadow Trotus existed before the catastrophe to over 15,000 ha of floodplain forest consists of tree species dominated by poplar, alder and willow and many herbaceous annual or perennial species. Lost in this way a quantity of biomass of at least 120,000 tonnes annually with a value energtică oil equivalent to 70,000, or 350,000 kW / h, equivalent power. Lost biodiversity, gene pool specific genotypes and meadow (Figure1.5).

FIGURE 5 - ECOLOGICALLY DEVASTATED AREA NEAR THE TOWN URECHESTI.
A HUGE FLOODPLAIN FOREST IS ONLY A CLUSTER OF TREES MORE RESISTANT

b) Were lost valley extending further additional 4500 ha of floodplain soils fertile. Loss of large amounts of soil and vegetation was correlated with river channel widening and creation of many threads of water flow in the same bed. A bed that was 60 before I got flood after flood in over 800 m (Figure 6).

FIGURE 6 - TROTUS RIVERBED LIMIT OF BACAU AND VRANCEA COUNTIES.
BED OCCUPIES OVER 800 M WIDE AND FLOWING RIVER WATER ON THREE WIRES.

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5. RESULTS

5.1. Logical Framework Approach

Based on analysis of existing situation in the basin Trotus tree problem is we built a complete picture of problem situation in the basin. The analysis, identified the following problem: high risk of floods and landslides in Basin Trotus (Figure 7).

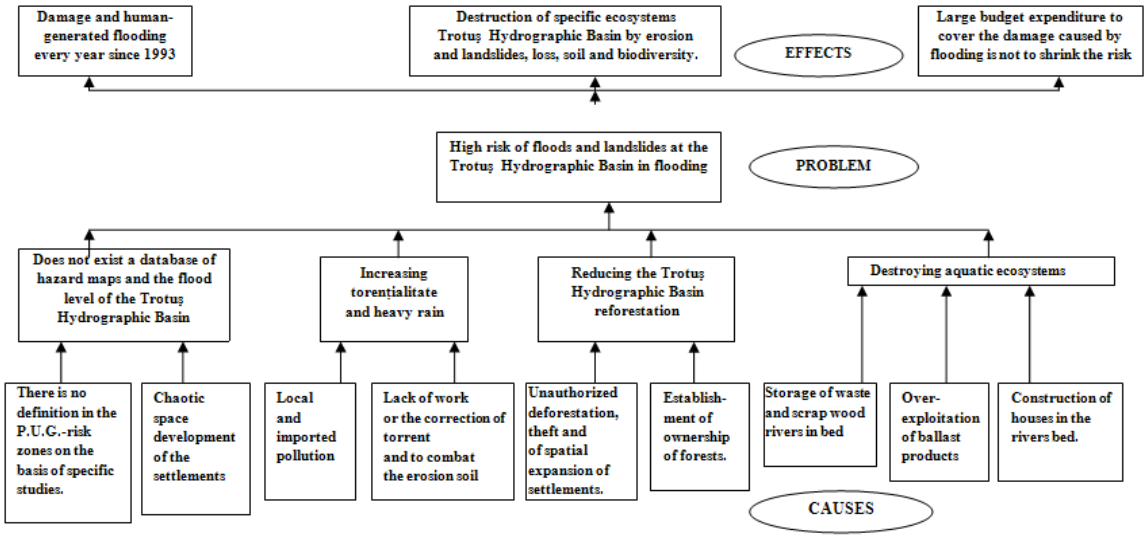

FIGURE 7 - THE TREE THE PROBLEM IN TROTUS HYDROGRAPHIC BASIN

The tree transformation problem in objective cause-effect: means-ends objectives we built tree (Figure 8).

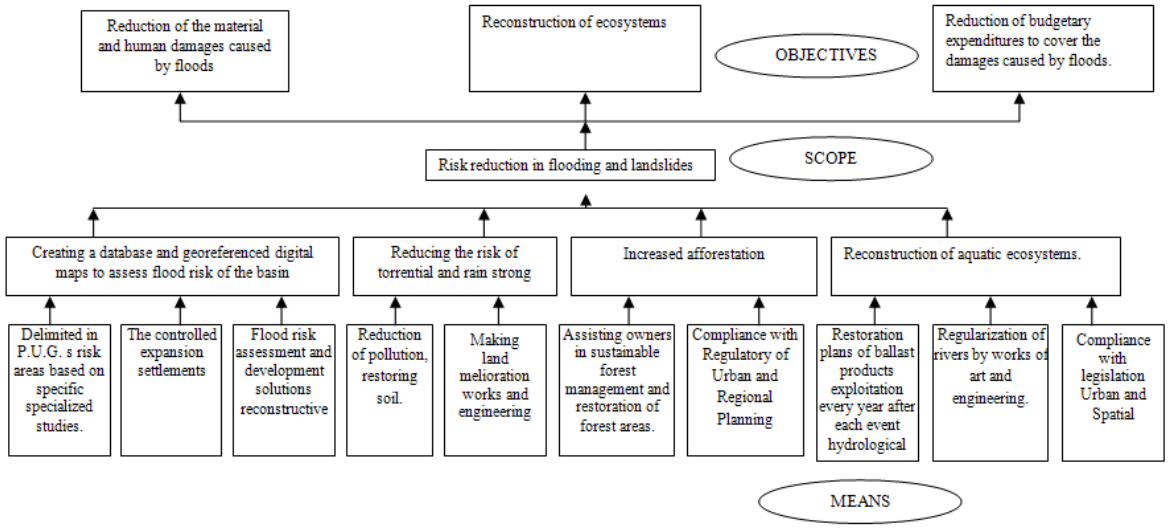

FIGURE 8 - THE TREE THE OBJECTIVES IN TROTUS HYDROGRAPHIC BASIN

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To establish the program strategy (Figure 9), has been considered the objectives tree scheme, we identified and formulated clearly and concisely the overall objective and strategic objectives.

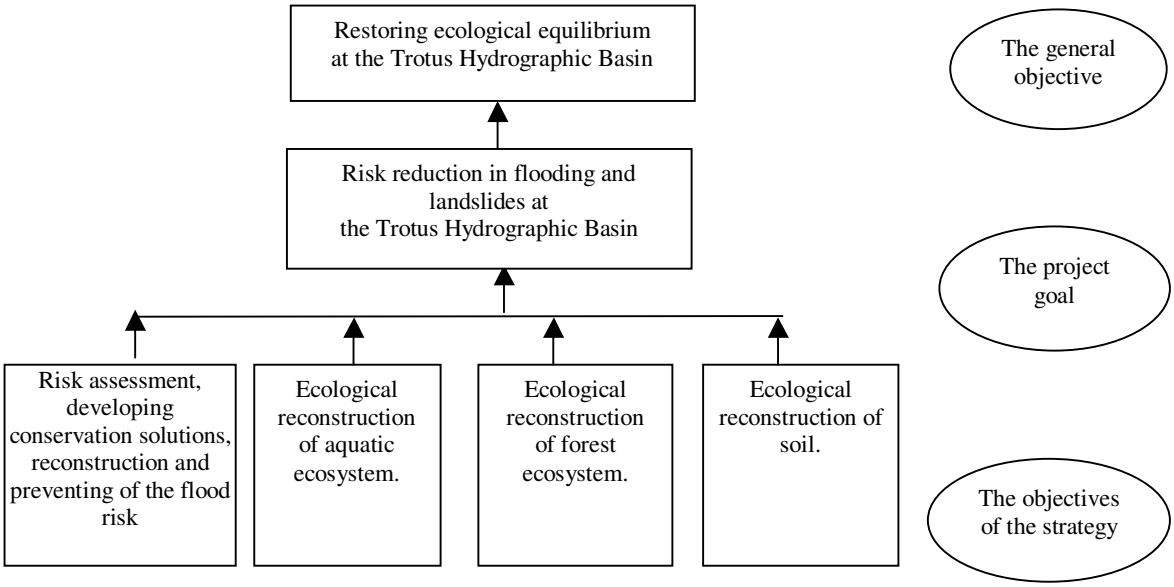

FIGURE 9 - CHOICE OF STRATEGY

We find that the overall objective of the program is very comprehensive and complex and strategic objectives can be, individually, each project independently, but only achieve four strategic objectives (projects) will help the aim and objective of the Programme. Planning four projects, establish timing or practicability in parallel is of vital importance because chaotic place in time and space of their implementation may result in unnecessary costs and investment to make works that will be restored. The first project due to start the reconstruction program should be to, providing all information about the potential vulnerability of ecosystems to natural and anthropogenic, to assess risk from flooding and landslides, to establish technical and managerial solutions conservation, restoration and sustainable use of components of biological diversity and ecological risk prevention and protection measures for reducing flood risk. Result project will be materialize in a Geospatial database and technical projects on ecological restoration solutions Basin Trotus.The project is complex and multidisciplinary research should involve specialists from different scientific fields to assess the risk level and to elaborate the best solutions. Only after completing this project can be started the other three projects specialists by other teams that will have to comply with proposed solutions in this project. Planning other projects is determined by the restoration of natural trends in ecological succession, the internal processes of ecosystems (ecosystem functions) and its components in order to achieve status ,,ecological climax" (is a theory first forwarded by ecologist Frederic Clements (1874-1945). The second project, must be one that will have to ensure consolidation of banks, rivers, slopes regulation by works of art and engineering construction, land reclamation works, by which to achieve reconstruction of aquatic ecosystem, others responsible for the destruction of ecosystems. Construction works for this project will be conducted from the

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highest area of the basin (the North) from the sources Trotus, of the county, flows into the Siret, in Vrancea County.

The third project, may be executed in parallel with the second project, as it progresses towards paying Trotus in Siret. Aimed at rehabilitating the forest ecosystem in the Main reforestarea forest areas in the North, stabilize hillsides affected by cuts which are subject to erosion abusive surface and depth, to stop the landslide phenomenon through extensive land reclamation, rehabilitation curtains forest and meadows of the South.

The fourth project will achieve the rehabilitation of the agricultural area of the South - ecological restoration of soil by land reclamation works. Execution of the project should begin in the uppermost area of the basin continued to Trotus flowing in Siret. The project can be executed in parallel with the third project, as it moves south.Scheme based on the strategy we have built the program Logical Framework matrix which is shown in Table 1.

TABEL 1 - LOGICAL FRAMEWORK APPROACH

INTERVENTION LOGIC	VERIFICATION INDICATORS	Sources of verification	Assumptions
General objective: Reconstruction ecological balance theTrotus Hydrographic Basin. **The project objective is included in:** - objectives of Directive 2007/60/EC, the European Parliament and the Council of 23 October 2007integrated in approach to flood risk management in hydrographic basins; - CE/60/2000 WFD-objectives, the first European directive that promotes a new strategy and policy in water management at European level that ensures sustainable development, harmonization of socio-economic development with the capacity of the aquatic environment; -in Law no. 575/2001 approving the National Spatial Plan - Section V Natural risk areas.	Reducing torrential phenomena, reducing rainfall intensity, reducing pollution (water, air, soil)	Statistical data, hydrological and meteorological forecasts. The hydrometric stations, mayors, Regional Agency Environmental	
Purpose of the project: Risk reduction in flooding and landslides at the Trotus Hydrographic Basin	The ecological material damage and reduced the production of hydro-meteorological phenomena.	Statistical data, mayors, Inspectorate for Emergency Situations Bacau.	Favorable conditions for obtaining financing from the budget because UE sustainability and impact; long-term benefits justify the costs of the project.
RESULTS: P1 Georeferenced database and digital maps, technical solutions and management of conservation, restoration and sustainable use of biological diversity and ecological components; P2 works of art and engineering: roads, viaducts, bridges, canals, building retaining walls for slopes, lakes forming strategic flood areas, to ensure water uses and reduce the risk of floods;polders with controlled flooding, the middle and lower sectors of water courses, to mitigate flood peak flows, dams (conducting channels) on short sections of river for flood protection of settlements and very important economic and social objectives,renaturation of rivers and creating suitable habitats for conservation and development of aquatic flora and fauna (the river renaturation is provides new spaces for flood mitigation and new spaces for nature represented the floodplain, where the new ecosystem will develop optimal conditions for flora and fauna aquatic and recreation and tourism); P3 Reconstruction of forest areas have been cleared, stabilizing banks and slopes with their micorizarea underbrush or forest or buildable area; P4Coverage the soil with vegetation, restoration of soils in the south (floodplain area): preventing and combating soil erosion and non-agricultural land, the deep erosion and landslides	P1Georeferenced database and digital maps, studies and technical projects P2 The length channels, surface slopes reinforced with art works and civil engineering, the number of polders, the number and surface reservoirs, land surface arranged for renaturation the river P3 Forest areas repotting, areas slopes reinforced by sea buckthorn plantations or micorizare P4The area restored grasslands and agricultural land	Mayors, field measurements, the minutes of receiving the papers, reports on project status. Mayors, field measurements, the minutes of receiving the papers, reports on project status. Mayors, field measurements, the minutes of receiving the papers, reports on project status. Mayors, field measurements, the minutes of receiving the papers, reports on project status.	Not involving local authorities and / or population to support implementation of the proposed solutions cover the entire surface vegetation of the basin, continuing unsustainable exploitation of forests (lack of sanitation works and network accessibility, abusive deforestation), failure of execution of the work schedule due to delays caused by expropriation and obtaining permits.

6. CONCLUSIONS

Money for ecological reconstruction Trotus Basin can not be used in an efficient and effective than addressing the approach ecosystem of the basin while the Logical Framework Matrix is extremely useful in

supporting program to the direct and indirect beneficiaries in the donors, in planning, coordination, implementation, monitoring and evaluation of reconstruction.

Matrix is the design and technical justification, economic and social environment, solutions for reconstructing basin, project planning and resources, quality assessment of the entire reconstruction program. it is bone that is built logically and rationally in dynamic program, allowing revaluation, review and adjust its.

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